John H. Ehrenreich

Robert F. Buttery

INCREASING FORAGE on Ozark wooded range

U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE

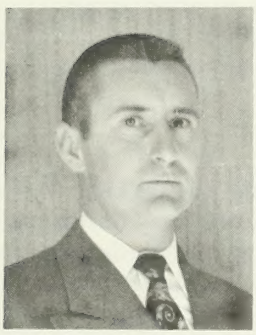
CENTRAL STATES FOREST EXPERIMENT STATION - TECHNICAL PAPER 177

DECEMBER 1960

Central States Forest Experiment Station, U. S. Dept. of Agriculture
Forest Service, 111 Old Federal Building, Columbus 15, Ohio
Richard D. Lane, Director

THE AUTHORS

JOHN H. EHRENREICH is a Range Conservationist and is project leader at the Columbia center in work dealing with forage identification, evaluation, production, and the effect of forest management on forage and wildlife habitat. He received his B. S. degree in Forestry and Range Management from Colorado A&M in 1951. After serving 2 years in the Air Force, he earned his M. S. in Range Management at Colorado A&M (1954); and later (1957), his Ph. D. in Ecology from Iowa State University. John holds memberships in the American Society of Range Management, Ecological Society of America and the Iowa Academy of Science. He is also a member of four scientific and professional honorary societies: Phi Kappa Phi, Sigma Xi, Xi Sigma Pi, Gamma Sigma Delta. He has authored or co-authored more than a dozen publications in the fields of range management and the ecology of grasslands.



ROBERT F. BUTTERY received his undergraduate training at Texas Tech College. He earned his B.S. in Animal Husbandry and Range Management in 1953 after serving with the Marine Corps in Korea in 1950-51. In 1955 he received his M. S. in Range Management from Colorado A&M. Bob served in various capacities at the Rocky Mountain and the California Forest and Range Experiment Stations before joining the technical staff of the Central States Station as a Range Conservationist in 1958. After two years of work in western Missouri he recently transferred to the Klamath National Forest in California. He has authored eight publications on the problems of range management, wildlife management, type conversion, and forage-weather relationships. He is a member of the American Society of Range Conservationists and Xi Sigma Pi, forestry honorary society.

For your reference file

(Cut out or copy)

Ehrenreich, John H. and Buttery, Robert F.
1960. Increasing forage on Ozark wooded range. U.S. Dept. Agr. Forest Serv. Cent. States Forest Expt. Sta. Tech. Paper 177, 10 pp., illus.

Experiments in the Missouri Ozarks show that forage production on wooded rangeland can be increased by eliminating woody plants (preferably with herbicides) to reduce competition, artificial seeding to improve composition, and fertilizing to increase growth.

INCREASING FORAGE on Ozark wooded range

by

John H. Ehrenreich and Robert F. Buttery

Most Ozark ranges are all or partly wooded. Nevertheless, nearly all such sites will grow dense stands of grass if the stand of trees is removed or kept open. In fact, one relatively treeless acre can produce as much forage as 40 to 60 acres of well-stocked forest. Many people believe that while large areas of forest-range should be managed for several uses, instead of trying to manage every acre for both timber and forage, one crop or the other should take precedence. That is, instead of grazing one cow on 40 to 60 acres of timberland, it would be better to remove the trees from one acre and devote it to forage production and use the other acres exclusively for growing trees.

THE PROBLEM

The big problem would be controlling the woody plants and weedy herbaceous vegetation on that one acre so as to increase forage production. To help solve this problem, a study was begun in 1956 to find out how burning, girdling, poisoning[1/], seeding, and fertilizing affect forage production.

THE STUDY

The study was made on the Sinkin Experimental Forest near Salem, Missouri. The area is typical of much of the fair to poor timbered range found on the ridgetops and flats throughout the central Ozarks. The most abundant grass on the area is poverty oat grass (Danthonia spicata (L.) Beauv.). It is accompanied by a very sparse stand of more palatable grasses such as little bluestem (Andropogon scoparius Michx.). Trees consist mostly of black oak (Quercus velutina Lam.), blackjack oak (Q. marilandica Muenchh.), scarlet oak (Q. coccinea Muenchh.), and post oak (Q. stellata Wangenh.) with various other hardwood species. Soils of the area are classified as Clarksville stony loam.

The study compared the following treatments which were applied in the spring of 1956: (1) burning in early spring to remove litter and kill understory hardwoods; (2) burning in early spring and girdling of overstory trees; (3) poisoning

---

1/ This was a cooperative study with Agricultural Research Service. Plant control phases of the study were under the direction of Dr. Elroy J. Peters of Crops Protection Research Branch, Crops Research Division, Agricultural Research Service at Columbia, Missouri.

both overstory and understory trees; (4) treating trees as in (3) and applying lime and fertilizer according to soil test (4 tons of lime and 584 pounds of 10, 30, 15 fertilizer per acre); and (5) check. A 1/10-acre plot in each of three replications of the above-mentioned site treatments was broadcast seeded to tall fescue (Festuca arundinacea Schreb.).

Herbage production was computed by the weight-estimate method described by Pechanec and Pickford (4). Density of herbaceous vegetation was taken by the all-points contact method (3); (5). [2/]

WHAT WE LEARNED

Must Reduce Woody Competition

By the second season after treatment herbage production had increased 40 to 60 times on plots where both high and low hardwood competition was reduced by either of two methods--poisoning or a combination of girdling overstory trees and spring burning. The check areas produced less than 30 pounds of herbage per acre per year whereas the treated areas produced more than 1,800 pounds of herbage per acre.

Although this study showed no difference in herbage production on areas treated with the two above-mentioned methods for hardwood control, other studies indicate that more permanent hardwood control and less sprouting is obtained by using silvicides (1); (2).

2/ Numbers in parentheses refer to Literature Cited, page 10.

Spring Burning Alone Not Very Effective

Early spring burning alone without other hardwood control increased herbage production two to three times the first growing season following burning, an increase of only 70 to 80 pounds of herbage per acre (fig. 1). Moreover, most of this increase was unpalatable plants seldom grazed by livestock except when other more desirable plants are scarce or absent. Even this small increase was relatively short-lived, and by the third or fourth growing season after the spring burn there was no difference in herbage production between the burned and check areas.

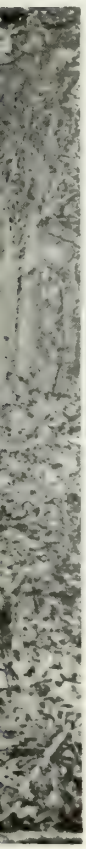


Figure 1.--Early spring burning did not significantly increase herbage production. Above - Year before burning. Left - One year after burning.

Figure 2.--One year after treating with 2,4,5-T and seeding to K31 fescue. Most of the herbage production is K31 fescue and other palatable species (top). Close-up of a plot seeded to fescue (bottom). A stand of fescue such as this helps hold down competition from hardwood sprout growth and weedy herbaceous plants.

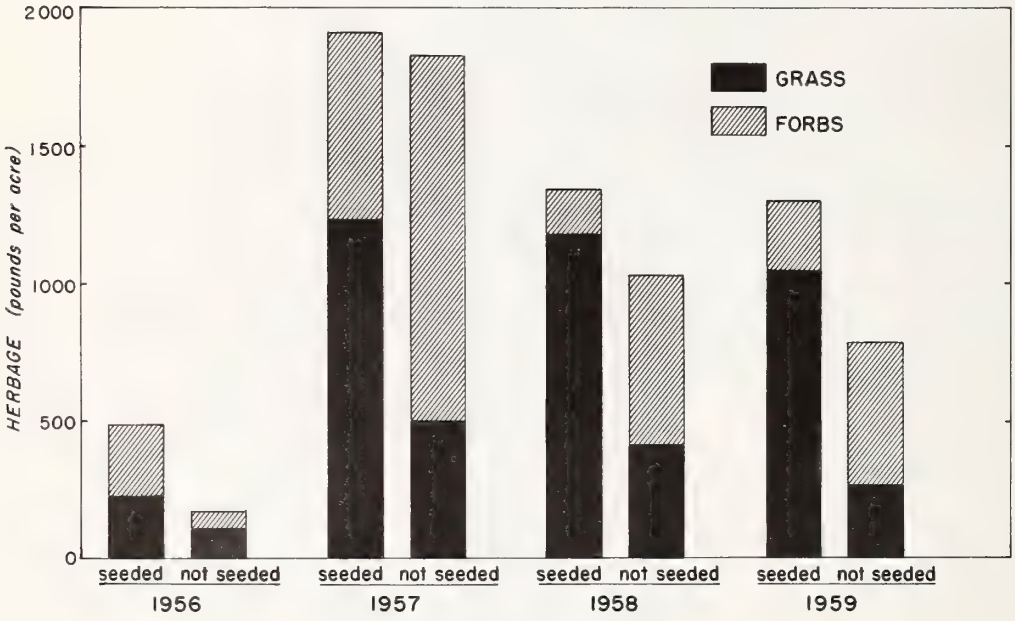
Seeding Makes the Difference

Although total herbage production was about the same on both seeded and unseeded areas, forage on the seeded area was much higher in quality. Fescue and other palatable grasses such as little bluestem, big bluestem (Andropogon gerardi Vitman.), and Indiangrass (Sorghastrum nutans (L.) Nash.) and grass-like plants such as sedge (Carex spp.) made up most of the total herbage yield on seeded plots (fig. 2). Fescue made up 80 to 90 percent of the grass production and 60 to 80 percent of the total herbage on seeded plots. On unseeded plots most of the increased herbage production was forbs such as partridge-pea (Cassia chamaecrista L.), bush clover (Lespedeza spp.), tick clover (Desmodium spp.), cinquefoil (Potentilla spp.), fireweed (Erechtites hieracifolia (L.) Raf.), horseweed (Erigeron canadensis L.), aster, (Aster spp.), and goldenrod (Solidago spp.) and undesirable grasses such as poverty oat grass (fig. 3).

Figure 3.--This area was treated with herbicides in early spring of 1956. Most of this 1957 herbage production is unpalatable weedy forbs such as the fireweed and horseweed in the foreground.

Total herbage production reached a peak the second growing season after treatment and decreased in subsequent years on both seeded and unseeded plots. This decrease in herbage production was practically all in weedy forbs with production of grasses remaining the same or dropping only slightly. Therefore, herbage production in the unseeded plots which were composed mostly of forbs, decreased more rapidly than on the seeded plots (fig. 4).

Figure 4.--Average herbage production on seeded and non-seeded areas treated with silvicides.



Fertilizer Increased Fescue Production

The single application of fertilizer had only a temporary effect--a 25-percent increase in yield the second season. Thereafter it had no apparent effect on production. On seeded plots fertilization resulted in more fescue whereas on unseeded plots it resulted in more forbs. Fertilization also increased seedling establishment of fescue and helped maintain a denser stand. The native grasses such as little bluestem showed little benefit from the fertilizers. However, if forage plants in this study had been grazed, all plants probably would have shown more response.

WHAT DOES IT MEAN?

In trying to increase forage production in timbered range it is necessary to control both woody and weedy herbaceous vegetation.

Although in this experiment poisoning and a combination of girdling and spring burning were equally effective in decreasing woody competition, other experiments indicate that use of silvicides is more effective and less destructive to the site. Repeated treatment may be necessary, however, to establish a permanent stand of grass. Spring burning alone is not effective in controlling either the large overstory trees or the small reproduction and only results in a small temporary increase in herbage production.

To get good forage production weedy herbaceous plants must also be controlled. Experience has shown that where a good nucleus of desirable native grasses occurs prior to treatment, weedy herbaceous growth is not a severe problem. However, on areas where desirable native grasses are scarce

or absent due to past mismanagement, seeding some adapted grass such as tall fescue is necessary. A good stand of grass will decrease the number and size of weedy herbaceous plants and slow down growth of sprouts.

Fertilization is helpful in establishing a good stand of seeded tame grasses, but does not seem to be necessary to establish a good stand of native grasses.

LITERATURE CITED

(1) Ehrenreich, John H., and Crosby, John S.
1960. Forage production on sprayed and burned areas in the Missouri Ozarks. Jour. Range Mangt. 13(2): 68-70.

(2) Elwell, Harry M., Elder, W. C., Klingman, Dayton L. and Larson, R. E.
1954. Aerial application of herbicides on oak in Oklahoma. Proc. 11th Annual Meeting, North Cent. Weed Com. Conf. pp. 91-95.

(3) Hansen, Herbert C.
1934. A comparison of methods of botanical analysis of the native prairie in western North Dakota. Jour. Agr. Res. 49(9): 815-842.

(4) Pechanec, J. R. and Pickford, G. D.
1937. A weight estimate method for the determination of range on pasture production. Jour. Am. Soc. Agron. 20(11): 894-904.

(5) Whitman, Warren C. and Siggeirsson, Einar I.
1954. Comparison of line interception and point contact methods in the analysis of mixed grass range vegetation. Ecol. 35(4): 431-436.

The Central States Forest Experiment Station is headquartered at Columbus, Ohio and maintains major field offices at:

Ames, Iowa (in cooperation with Iowa State University)
Athens, Ohio (in cooperation with Ohio University)
Bedford, Indiana
Berea, Kentucky (in cooperation with Berea College)
Carbondale, Illinois (in cooperation with Southern Illinois University)
Columbia, Missouri (in cooperation with the University of Missouri)